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| In re application of: | § | Group Art Unit 2128 |
| Craig M. Jarchow | § | |
| | § | |
| Serial No. 09/498012 | § | Examiner: Day, Herng Der |
| | § | |
| Filed: February 4, 2000 | § | Attorney Docket No. APA-001 |

Title: System for Estimating Thickness of Thin Subsurface Strata

Commissioner for Patents
P. O. Box 1450
Alexandria, Virginia 22313-1450

DECLARATION UNDER 37 C.F.R. 1.132

Dear Sir:

I, David J. Monk declare as follows:

1. I received a Bachelor of Science Degree in Physics from the University of Nottingham in 1976, and a Ph.D. in Physics from the University of Nottingham in 1980.

2. I have 23 years of experience in the seismic business, including both data acquisition and processing. I am currently employed by Apache Corporation, of Houston, Texas, the assignee of the above-captioned U. S. Patent Application, as Manager of Geophysics, with technical responsibility for worldwide geophysical activity, including seismic data acquisition and data processing.

3. A listing of patents on which I am either a sole or joint inventor, a listing of my published technical papers, and honors are attached.

4. I have read and understand US Patent 6,131,071, which issued to Partyka et al. on October 10, 2000, and the article "Maximum entropy analysis of dispersed seismic signals" by K. B. Cox and I. M. Mason, published in Geophysics, Vol. 51, No. 12, December 1986. I have also read and understood US Patent Application Serial No. 09/498,012, having a filing date of February 4, 2000.

5. I agree that Partyka et al. do show the first elements of claim 1 and the portion of the second element of US Patent Application 09/498,012, as follows:

> defining seismic data windows extending over selected portions of said group of spatially related seismic data traces;
>
> generating a frequency spectrum of the seismic data within successively selected windows of said seismic data traces by applying a transform to said successively selected windows;

I also agree that Partyka et al shows the third element of claim 1:

> determining the frequency having the greatest amplitude within the frequency spectrum of the seismic data within said successively selected windows

However, the Examiner has combined the first two elements and the third element in a manner <u>that</u> Partyka et al. do not.

Partyka et al. disclose a method for identifying the location of thin beds in which data windows are formed and frequency spectra within the data windows are formed, and these data windows are utilized to investigate for thin beds. However, Partyka et al. disclose only the identification of troughs in the data for determining the location of thin beds. In no instance do Partyka et al. teach or suggest the identification of frequency peaks in the frequency spectra for the indemnification of thin beds. The identification of <u>troughs</u> as indicating the presence of thin beds is discussed in the Partyka et al. reference in the Abstract, and in col. 7, line 17; col. 13, line 11; col. 13, line 43-55; col. 20, line 40; col. 20, line 49; col. 20, lines 60-67; col. 21, line 3-9; col. 20, lines 23-29; col. 20, line 42; col. 25, line 15-23; and col. 32, line 53. The portion of the Partyka et al. disclosure cited as disclosing the third element of claim 1 (determining the frequency having the greatest amplitude within the frequency spectrum of the seismic data within said successively selected windows) is in a section of the Partyka et al. patent titled

"Alternative Tuning Cube Attribute Displays", in which Partyka et al. discuss a variety of seismic attributes having nothing to do with thin beds. Partyka et al. introduces this section with the statement "It is anticipated by the instant invention that the tuning cube technology disclosed herein might yield additional insights into seismic reflection data beyond the detection and analysis of thins beds discussed previously". (emphasis added) It appears that the combination of the third element with the first two elements was done because of the disclosure of the present application and not through the disclosure in Partyka et al.

Partyka et al. also do not show the fourth element or the fifth element of claim 1. There are commercially available visualization software programs that are capable of utilizing the determined frequencies having the greatest amplitude to generate a seismic display in which horizontal dimensions represent distance and vertical dimensions represent time. However, it is only because of the disclosure of applicant's invention that one would be led do supply the appropriate data and to direct such a program to generate such a seismic display, and to utilize such a display to determine the presence of thin beds.

The claim elements said in the Office Action to be present in Partyka et al, are not disclosed in Partyka et al., therefore, Partyka et al cannot be combined with Cox et al. to construct the invention as claimed in claim 1.

With respect to Cox et al., Cox shows a maximum entropy transform, which is a transform having poles on the unit z-circle, where z is the z-transform, and. Partyka et al. also disclose that transforms could be utilized to practice the Partyka et al. method other than the Fourier transform. However, there is nothing in either Partyka et al. or Cox et al. that would lead one of ordinary skill in the art to select a transform having poles on the unit z-circle, where z is the z transform for use in the present invention.

As stated in the present application, use of the maximum entropy transform permits a shorter time window to be utilized. It is an object of the invention to identify just one peak in the frequency spectrum, rather than to precisely estimate the entire spectrum. The transform having poles on the unit z-circle where z is the z-transform it utilized in the present invention because it provides a greater accentuation of peaks in the spectral distribution than a Fourier transform. It is recognized that in the present invention the estimate of the frequencies away from the peak frequency may be poor.

In contrast, Cox et al. teach that "It is possible to enhance the resolution of a moving-time window analyzer by using a maximum entropy power spectral estimator to approximate the spectrum of each windowed segment of a trace." The objective of Cox et al. is to "approximate the spectrum of each windowed segment", that is, to accurately approximate the spectrum. It is the object of the present invention of provide greater accentuation of just one peak in a frequency spectrum, rather than to approximate the entire spectrum. There is no suggestion whatsoever in Cox et al. for using the maximum entropy transform or any other transform to provide greater accentuation of a peak in a spectral distribution than a Fourier transform provides.

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United states Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

David J. Monk

5.26.05

Date

**PATENTS:**

"Dual Sensor Signal Processing Method for On-bottom Cable Seismic ", USA Patent 6,539,308.

"Dual Sensor Signal Processing Method for On-bottom Cable Seismic Wave Detection", USA Patent 6,314,371.

"Dual Sensor Signal Processing Method for On-bottom Cable Seismic Wave Detection", PCT (Patent Cooperation Treaty), Patent WO101170A1.

"Multimedia Techniques for Multidimensional Data Interpretation", PCT (Patent Cooperation Treaty), Patent WO101350A1.

"An Interpolation Method for Aliased Noisy Seismic Data", USA Patent 5,235,556.

"Method for Attenuating Undesirable Data, such as Multiples, using Constrained Cross-Equalization", USA Patent No 5,309,360.

"A Noise Attenuation Method", USA Patent No 5,138,583.

"Processing Method for Marine Seismic Surveying Utilizing Dual Streamers", USA Patent No 4,937,793.

**PUBLISHED TECHNICAL PAPERS:**

Non Seismic Related:

1. ***"Microwave Acoustic Relaxation Losses in MgO due to Fe2+"***, Journal of Physics C: Solid State Physics. (1978)
2. ***"APR and Acoustic Relaxation of Fe2+:KMgF3"***, Proceedings of 6th International Acoustic Symposium. Grenoble (1978)
3. ***"Anomalous Acoustic Relaxation Absorption and Acoustic Paramagnetic Resonance in KMgF3 Containing Fe"***, Acta Physica Slovaka. (1979)
4. ***"Microwave Acoustic Relaxation Due to Ni3+ Ions in*** $Al_2O_3$***"***, Proceedings of the 3rd International Conference on Phonon Scattering in Condensed Matter. (1979)
5. ***"Phonon Spectroscopy on Mn3+ in MgO"***, Proceedings of the 3rd International Conference on Phonon Scattering in Condensed Matter. (1979)
6. ***"The Photoconductivity of Cr-doped GaAs: Dynamic Effect, Some Recent Measurements"***, Proceedings of 7th International Acoustic Symposium. Nottingham (1979)
7. ***"The Origin of the Acoustic Relaxation Peak Associated with Cr in GaAs"***, Proceedings of 7th International Acoustic Symposium. Nottingham (1979)
8. ***"Investigations of Cr in GaAs using Phonons"***, Proceedings of the International Conference on Semi-Insulating III-V Materials. (1980)
9. ***"Ni3+ in*** $Al_2O_3$***: An Acoustic Relaxation Study"***, Journal of Physics C: Solid State Physics. (1980)

Seismic Related:

1. *"Streamer Noise Mechanisms"*, Proceedings of the Inaugural SEG Gulf Coast Exploration and Development Meeting. Houston, Texas (1985)
2. *"The Development of Low Noise Digital Streamers"*, Proceedings of 48th Annual EAEG Conference, Ostend, Belgium (1986)
3. *"The Development of Low Noise Streamers in Marine Seismic Data Collection"*, Proceedings of XVI Annual NOFTIG meeting, Trondheim, Norway. (1987)
4. *"Limitations of Dip Moveout (DMO) in Seismic Data Processing"*, Proceedings of XVI Annual NOFTIG meeting, Trondheim, Norway. (1987)
5. *"Titan 1000: A Second Generation Marine Digital Streamer System"*, Proceedings of 49th Annual EAEG Conference. Belgrade. (1987)
6. *"Seismic Data: Resolution in Display"*, Proceedings of NPF Biannual Geophysical Seminar, Kristiansand, Norway. (1988)
7. *"Resolution of Seismic Velocities"*, Proceedings of NPF Biannual Geophysical Seminar, Kristiansand, Norway. (1989)
8. *"Wavefield Separation of Twin Streamer Data"*, Proceedings of 51st Annual EAEG Conference, Berlin. (1989)
9. *"Frequency Dispersion in Finite Difference Migration"*, Proceedings of 51st Annual EAEG Conference, Berlin. (1989)
10. *"Wavefield Separation of Twin Streamer Data"*, First Breaks. (Feb. 1990)
11. *"Noise Attenuation in Seismic Data"*, Proceedings of NPF Biannual Geophysical Seminar, Kristiansand, Norway. (1990)
12. *"Statistical Evaluation of Air-Gun Array Performance"*, Proceedings of 60th Annual SEG Meeting San Francisco. (1990)
13. *"Wave Equation Multiple Suppression Using Constrained Cross-Equalization"*, Annual Meeting of the Canadian SEG (1990)
14. *"Wave Equation Multiple Suppression Using Constrained Cross-Equalization"*, Proceedings of 53rd Annual EAEG Conference, Florence. (1991)
15. *"Modeling Air-Gun Array Performance Specifications"*, Proceedings of 53rd Annual E.A.E.G. Conference, Florence. (1991)
16. *"Wave Equation Multiple Suppression Using Constrained Cross-Equalization"*, SBG - Sociedade Brasileira de Geofisica (Brazilian Geophysics Society). (1991)
17. *"Wave Equation Multiple Suppression Using Constrained Cross-Equalization"*, Proceedings of 61st Annual SEG Meeting, Houston. (1991)
18. *"Seismic Noise Attenuation and Preservation of Amplitude"*, 1992 Continuing Education program SEG, Oklahoma City. (1992)
19. *"An Approach to Optimizing the Tau-P Transform"*, Proceedings of Annual Gulf Coast SEG Conference, Houston. (1992)

20. *"An Approach to Optimum Slant Stack, Its Application as a Noise Attenuator"*, Proceedings of 54th Annual EAEG Conference, Paris. (1992)
21. *"Effects of Air-Gun Firing Time Variations on Signal Stability"*, Proceedings of 54th Annual EAEG Conference, Paris. (1992)
22. *"An Approach to Optimum Slant Stack and Its Application as a Noise Attenuator"*, Proceedings of 62nd Annual SEG Meeting, New Orleans. (1992)
23. *"3D Time Variant Dip Moveout by the FK Method"*, Proceedings of the 11th Annual Egyptian Petroleum Exploration/Production Conference. (1992)
24. *"Wave Equation Multiple Suppression Using Constrained Cross-Equalization"*, Proceedings of the 11th Annual Egyptian Petroleum Exploration/Production Conference. (1992)
25. *"Seismic Noise Attenuation Using the "Radon" Method"*, and Preservation of Amplitude", Proceedings of the 11th Annual Egyptian Petroleum Exploration/Production Conference. (1992)
26. *"Prediction Filtering for 3D Post Stack Data"*, Proceedings of the 10th Annual Petroleum Congress and Exhibition of Turkey. (1993)
27. *"The Effect of Navigation Errors on Seismic Data"*, Proceedings of the 55th Annual EAEG Conference, Stavanger. (1993)
28. *"Prediction Filtering for 3-D Post Stack Data"*, Proceedings of the Annual Gulf Coast S.E.G. Conference, Houston. (1993)
29. *"In field Assessment of Seismic Data in Relation to Processing Objectives"*, Proceedings of the SEG Summer workshop (3D seismology : Integrated comprehension of large data volumes), Rancho Mirage, California (1993).
30. *"Wave Equation Multiple Suppression Using Constrained Cross-Equalization"*, Geophysical Prospecting. Vol. 41 pp. 725-736 (1993)
31. *"An Approach to Optimum Slant Stack, Its Application as a Noise Attenuator"*, First Breaks. (1993)
32. *"Prediction Filtering for 3D Poststack Data"*, Proceedings of the 63rd Annual SEG Conference, Washington (1993).
33. *"Random and Systematic Navigation Errors: How do they Affect Seismic Data Quality"*, Proceedings of the 63rd Annual SEG Conference, Washington (1993).
34. "A Total Quality Management Approach to Assessment of the Distribution of 3D Seismic Data", Proceedings of the NPF Biannual Geophysical Conference : The 3D Seismic Challenge, Kristiansand, Norway (1994).
35. *"Random and Systematic Navigation Errors : How do they Affect Seismic Data Quality"*, Proceedings of the NPF Biannual Geophysical Conference : The 3D Seismic Challenge, Kristiansand, Norway (1994).
36. *"Evaluation of Sea Bottom Features from Seismic Calibration Data : A Case History"*, Proceedings of the SEG/EGS Cairo '94 Pan African/Middle East Exploration and Development Conference (1994).

37. *"Evaluation of Sea Bottom Features from Seismic Calibration Data : A Case History"*, Proceedings of the 56th Annual EAEG Conference, Vienna (1994).
38. *"Integrated Analysis of Geometry Dependent Seismic Wavelet Reliability"*, Proceedings of the 56th Annual EAEG Conference, Vienna (1994).
39. *"Evaluation of Sea bottom features from Seismic Calibration Data : A Case History"*, Proceedings of the 64rd Annual S.E.G. Conference, Los Angeles (1994).
40. *"Evaluation of Sea bottom features from Seismic Calibration Data : A Case History"*, Invited paper : Proceedings of the 10th Annual S.E.G. Gulf Coast Exploration and Development Meeting. Houston, Texas ( 1995 )
41. *"Model based 3D seismic survey design"*, Proceedings of the 57th Annual E.A.E.G. Conference Glasgow ( 1995 )
42. *"An evaluation of seismic data compression on the interpretability of the final product"*, Proceedings of the 57th Annual E.A.E.G. Conference Glasgow ( 1995 )
43. *"Acquisition of a bottom cable 3D seismic survey, offshore Dubai, UAE - A case history"*, Proceedings of the 57th Annual E.A.E.G. Conference Glasgow ( 1995 )
44. *"DMO implications for 3D survey design"*, Proceedings of the 65th Annual S.E.G. Conference Houston ( 1995 )
45. *"DMO Illumination variations due to 3D geometry"*, Proceedings of the 58th Annual E.A.E.G. Conference Amsterdam ( 1996 )
46. *"Spatial Interpretation of 3D seismic project specifications : An effective way to reduce costs"*, Proceedings of the 1st International Indonesian Geophysical conference Jakarta ( 1996 )
47. *"DMO implications for 3D survey design"*, Proceedings of the 1st International Indonesian Geophysical conference Jakarta ( 1996 )
48. *"Effect of 3D survey irregularities on amplitudes in 3D time slices(acquisition footprint in 3D seismic surveys)"*, Proceeding of 65rd Annual S.E.G. Conference, Denver (1996).
49. *"Spatial Interpretation of 3D Marine Seismic Project Specification, An effective way to reduce costs", OTC (1997)*
50. *"Survey geometries that achieve uniform offset and azimuth sampling," EAEG (1997).*
51. *"Spatial Interpretation of 3D Seismic Project Specification, An effective way to reduce cost," EAEG (1997)*
52. *"3D Survey Design to Avoid DMO Processing Artifacts"*, Proceedings of SEISMIC '97 the 6th International Conference.
53. *"High-resolution 3-D: New Focus for an existing tool"*, World Oil May 1997.
54. *"Current and Future Development and Application of 3D Time Lapse seismic (4D)"* Invited lecture: Annual meeting of the Society of Explorationists in the Emirates. (1997)
55. *"Considerations in Development and Application of 4D seismic data"*, Proceedings of the SEG/EGS conference, Cairo, Egypt (1998)

56. ***"Sea Floor Dynamics in an Ocean Bottom Environment"***, Proceeding of I-O Sensor workshop, Norwich (1998).
57. ***"Pitfalls in Seismic Acquisition"***, Proceeding of 67th Annual S.E.G. Conference (Pitfalls Workshop), New Orleans (1998).
58. ***"3D Design problem: some more questions and answers "***, (1999) Annual E.A.E.G. convention Helsinki June.
59. ***"The Challenges of 4D – The Feasibility Study"***. Proceedings of the Annual NPD conference Norway (1999)
60. ***"3D Survey Design: The business of Cost Reduction"*** Proceeding of 68th Annual S.E.G. Conference (Land Acquisition Workshop), Houston (1999).
61. ***"3D Survey Design: A solution"***. First Break Vol 18 no. 5. May (2000).
62. ***"The Value of Low Frequency"***, Proceeding of I-O Sensor workshop, Norwich (2001).
63. ***"High Altitude Weight Drop Source"***, Oil and Gas Journal Vol 99.37 Sept 10th (2001).
64. ***"Bombs Away"***, Apache Corporation ARROWS Vol 31 Issue 1 January (2002).
65. ***"High Altitude Weight Drop"***, Proceeding of I-O Sensor workshop, Norwich (2002).
66. *"Lena: A seismic Model"*, The Leading Edge, Vol 21 No.5, May (2002).
67. ***"Canadian Seismic with aThump"***, Proceeding of the Annual C.S.E.G. Conference, Calgary (2002).
68. ***"Canadian Seismic with aThump"***, Recorder, Vol 27 No 5, May (2002).
69. ***"Implementing technology with effiency: A case history of 3D seismic in Egypt."*** Proceedings of the AAPG conference Cairo 2002.
70. ***"Passive Seismic.. Listen: is it the next big thing?"*** Interview by Louise Durham for the AAPG Explorer April (2003)

**ADDITIONAL HONORS:**

Recipient of Canadian Society of Exploration Geophysicsists (CSEG) Best Paper Award "Extreme Geophysics" 2002.

Recipient of Hagedoorn Award in 1994 from European Association of Exploration Geophysicsists (EAEG), for contributions to Geophysics.

Recipient of Society of Exploration Geophysicsists (SEG) Best Paper Award, 1993

Session Chairman for Annual SEG Conference, 1993, 1992 and 1991

Session Chairman for Annual EAEG Conference, 1992, 1991 and 1990

Served on the 1992 SEG Technical Committee as the representative for "Seismic Processing", and as workshop co-ordinator for various workshops since then.

External Referee, for MSc thesis at the University of Houston Allied Geophysical Lab.

Technical Program Chairman, 2005 Society of Exploration Geophysicists Annual Meeting